



Module 14



STEP 8 Conduct Feasibility Study

Civil Works Orientation Course -
FY 11

Objective:

This module will discuss the following:

- ▮ **What is Federal water resources planning?**
- ▮ **What is the purpose of the feasibility study?**
- ▮ **What are the six steps of the planning process (and how are plans evaluated)?**



A PLANNING MODEL

What are the problems?

How might they be solved?

What are the advantages and disadvantages of all potential solutions?

Consider all different viewpoints.

What's the best solution for meeting Corps criteria?

Implement the solution.

Feedback.

FEDERAL WATER RESOURCES GUIDELINES

*** Principles and Guidelines currently under revision

1.3.2 Major Steps - steps, iteration

1.4.4 Federal-State Relationship in Planning

1.4.2 International Consultations

1.4.3 General Public Participation

1.4.4 Review and Consultation

1.4.5 Interdisciplinary Planning

1.4.7 Planning Area

1.4.12 Period of Analysis

**“Economic and Environmental Principles and Guidelines for
Water and Related Land Resources Implementation
Studies”**

FEDERAL FORMULATION CRITERIA

***Alternative plans...should be formulated
in consideration of four criteria:***

- (1) Completeness.**
- (2) Effectiveness.**
- (3) Efficiency.**
- (4) Acceptability**

Guidelines

Principles and

Paragraph 1.6.2(c)

CORPS PLANNING REFERENCES

ER 1105-2-100 - Chapter 2

Planning Manual - Chapters 5, 12,
13

Feasibility Study

Purposes:

- ▮ **Describe and evaluate alternative plans**
- ▮ **Describe in detail the recommended plan:**
 - NED – National Economic Development**
 - NER – National Ecosystem Restoration**
 - LPP – Locally Preferred Plan**
 - FRM – Safety Plan**
- ▮ **Prepare a feasibility report**

Feasibility Report

Purposes:

- ▮ Serves as a Decision Document to convince the Office of Management and Budget (OMB) of project viability
- ▮ Is an Authorization Document and is submitted to Congress for project authorization

Feasibility Phase - Cost Sharing:

▮ Feasibility phase is cost shared equally

between the Federal (Corps) and the non-Federal sponsor(s) in accordance with FCSA

▮ EXCEPTION: Inland navigation studies are 100% Federally funded



Six Steps in Planning Process:

- ❑ **Step 1 - Problems and Opportunities**
- ❑ **Step 2 - Inventory and Forecast Resources**
- ❑ **Step 3 - Formulating Alternative Plans**
- ❑ **Step 4 - Evaluation of Alternative Plans**
- ❑ **Step 5 - Comparison of Alternative Plans**
- ❑ **Step 6 - Select Recommended Plan**

Project Planning



STEP 1: Problems and Opportunities

- ▮ **Identify the setting:**
 - ▮ **Partnership**
 - ▮ **Planning area**
 - ▮ **Period of analysis**
 - ▮ **Interdisciplinary team**
 - ▮ **Stakeholders**
 - ▮ **Public scoping meeting**
- ▮ **Specific problems**
- ▮ **Specific opportunities**
- ▮ **Specify planning, goals, objective and constraints**

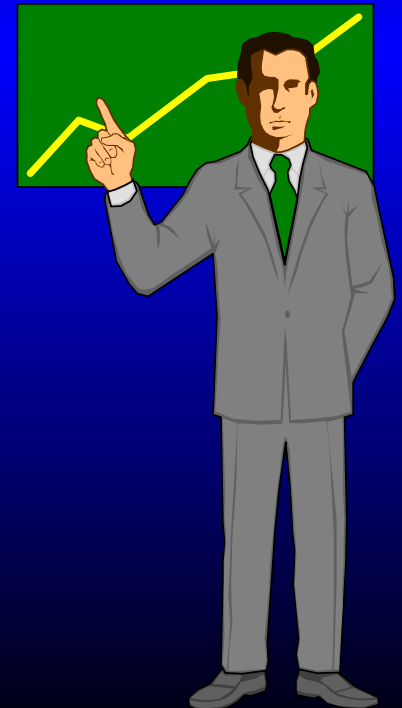


STEP 2: Inventory and Forecast Resources

- ❑ **Planning requires information**
- ❑ **External and internal factors influence the study environment**
- ❑ **Determine existing conditions**
- ❑ **Forecast future conditions and establish**

Without Project Condition(s)!!

Schedule FSM at this time



STEP 3: Formulation of Alternative Plans

- ▮ **Plan formulation is using systems of measures, strategies, or programs to fully or partially meet the identified planning objectives, subject to the planning constraints.**
- ▮ **Generating “full” array of reasonable alternatives (NEPA)**
 - ▮ **Identify all significant impacts to resources**
- ▮ **The Principles and Guidelines (P&G) is the standard to formulate alternative plans**
 - ▮ **Effective**
 - ▮ **Efficient**
 - ▮ **Complete**
 - ▮ **Acceptable**

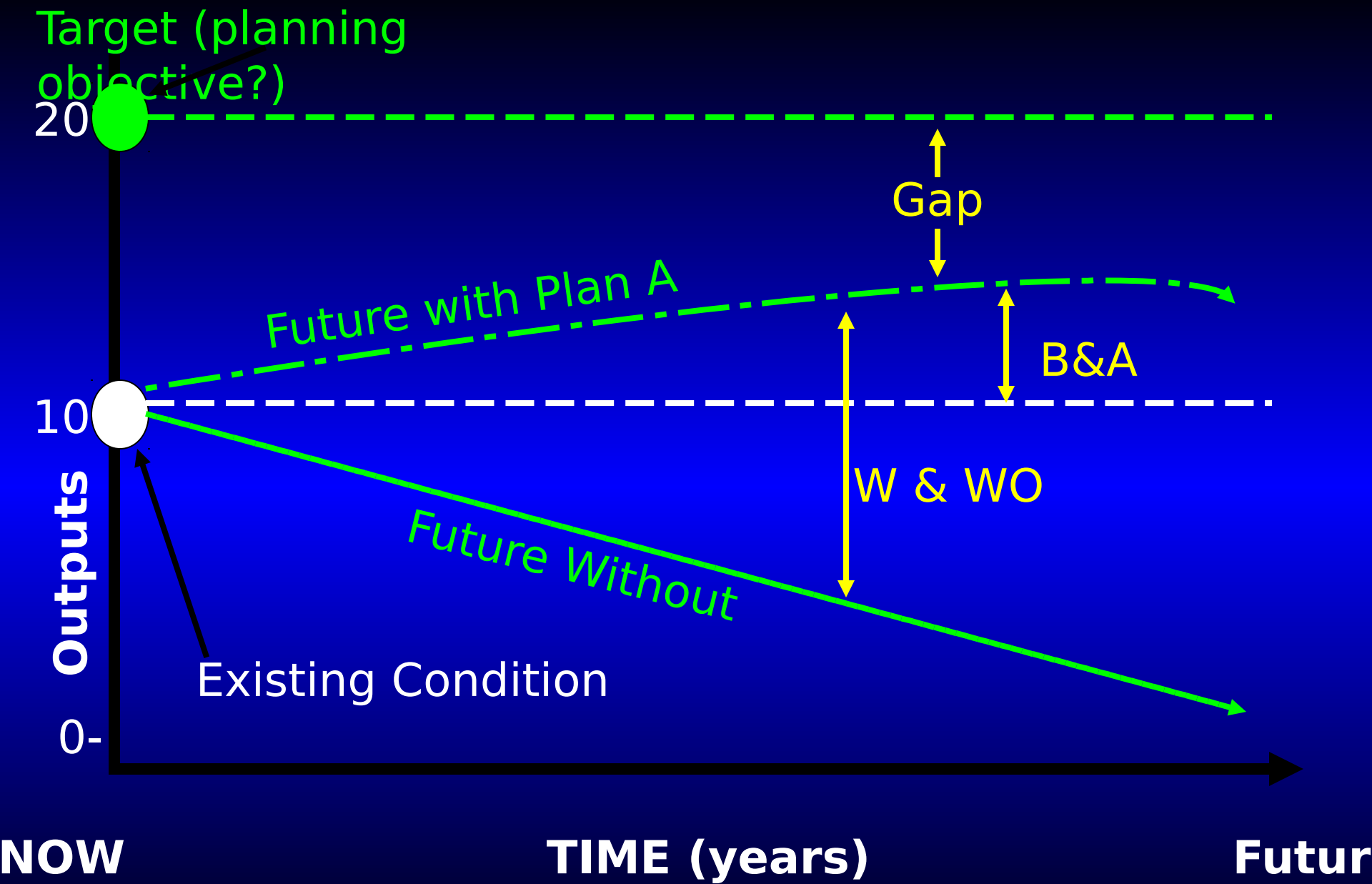
Feasibility Scoping Meeting (FSM)

- ▮ **Reference ER 1105-2-100 Appendix G**
- ▮ **Mandatory meeting with the Corps Vertical Team, sponsors, agencies, and stakeholders**
- ▮ **Establish buy-in for Without Project Condition(s)**
- ▮ **Review/Update analysis yet to be done**
- ▮ **Present preliminary measures and an array of preliminary alternatives**

STEP 4: Evaluation of Alternative Plans

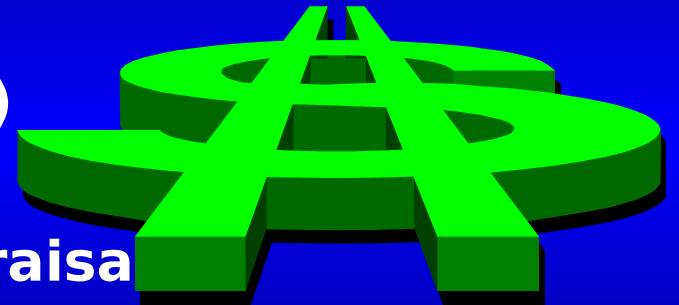
- ▮ **Compare with and without project conditions**
- ▮ **Screen alternatives**
- ▮ **Evaluate alternatives and present results of:**
 - ▮ **Costs and Mitigation Requirements**
 - ▮ **Benefits (monetary and non-monetary)**
 - ▮ **Residual Risk for Loss of Human Life**
 - ▮ (New - Section 2033 WRDA 2007)
 - ▮ **P&G Accounts Impacts**
 - ▮ **NED - National Economic Development**
 - ▮ **RED - Regional Economic Development**
 - ▮ **EQ - Environmental Quality**
 - ▮ **OSE - Other Social Effects**





PROJECT COSTS

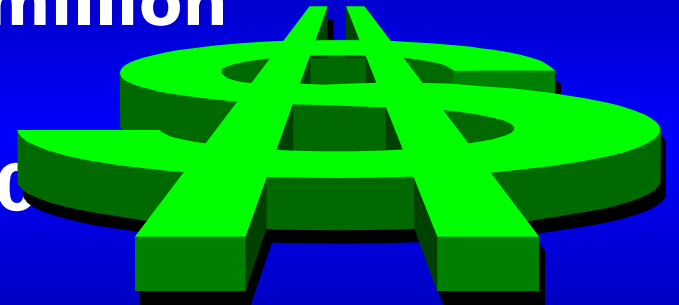
- ▮ **Preconstruction, Engineering and Design (PED) Costs**
- ▮ **Construction Costs (M-CACES)**
- ▮ **Real Estate Costs (Gross Appraisal)**
- ▮ **Operation & Maintenance Costs**



[Convert these costs to annual costs for comparison]

PROJECT COSTS

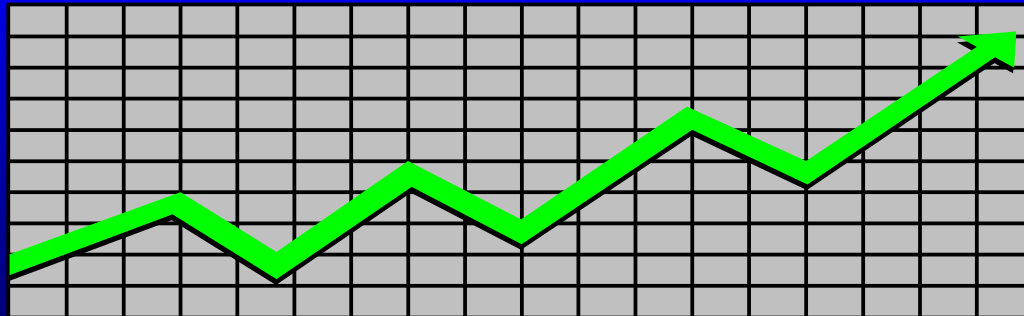
- ▮ Mobilize and Demobilize Dredge = \$900,000
- ▮ Dredge Channel = \$18.9 million
- ▮ Real Estate = \$6 million
- ▮ Plans and Specs. = \$900,000
- ▮ S&A = \$450,000
- ▮ FIRST COST TOTAL = \$27,170,000



- ▮ Annualized First Cost = \$2,218,000
- ▮ Annualized O&M = \$125,000
- ▮ Annual Cost = \$2,343,000

EVALUATE PLANS ECONOMICALLY

- ▮ **Determine period of evaluation (typ. 50 or 100 years)**
- ▮ **Determine benefits (NED and/or NER) and costs of the project**



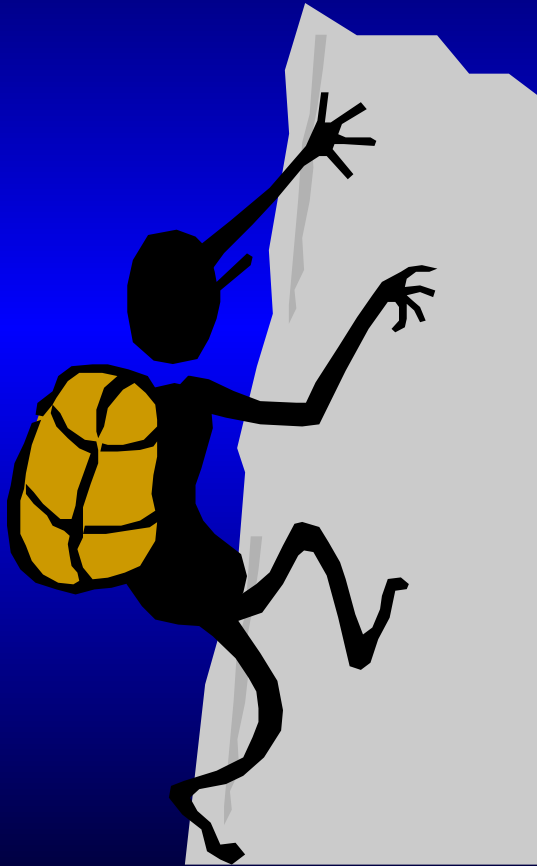
NED BENEFITS



▮ **Contributions to NED account are the direct net benefits that accrue in the study area and the rest of the nation.**

- ▮ **Commercial navigation improvements**
- ▮ **Flood Risk Management**
- ▮ **Hydropower**
- ▮ **Recreation**
- ▮ **Et al**

NED ANALYSIS PROCESS



- ▮ **Calculate NED benefits and costs at a common point in time - such as the end of the installation / construction period**
- ▮ **Convert this value to an average annual value**
- ▮ **Benefits are quantified for each alternative being evaluated**

NED PLAN

Plan with the greatest net benefits!

***[Net benefits = average annual
benefits -
average annual costs]***

NED Analysis

Annual	Annual		Net	
	Benefits	Costs	BCR	Benefits
PLAN A	\$ 80,000	\$100,000	0.8	(\$20,000)
PLAN B	\$110,500	\$ 85,000	1.3	\$25,500
PLAN C	\$192,000		\$160,000 1.2	
	\$32,000			
PLAN D	\$232,000	\$208,000	1.1	\$24,000

NER BENEFITS – ECOSYSTEM RESTORATION

NER = National Ecosystem Restoration

- ▮ **Non-monetary project benefits or outputs**
- ▮ **Significance of resource must be explained**
- ▮ **Ecosystem outputs must be measurable and quantifiable**

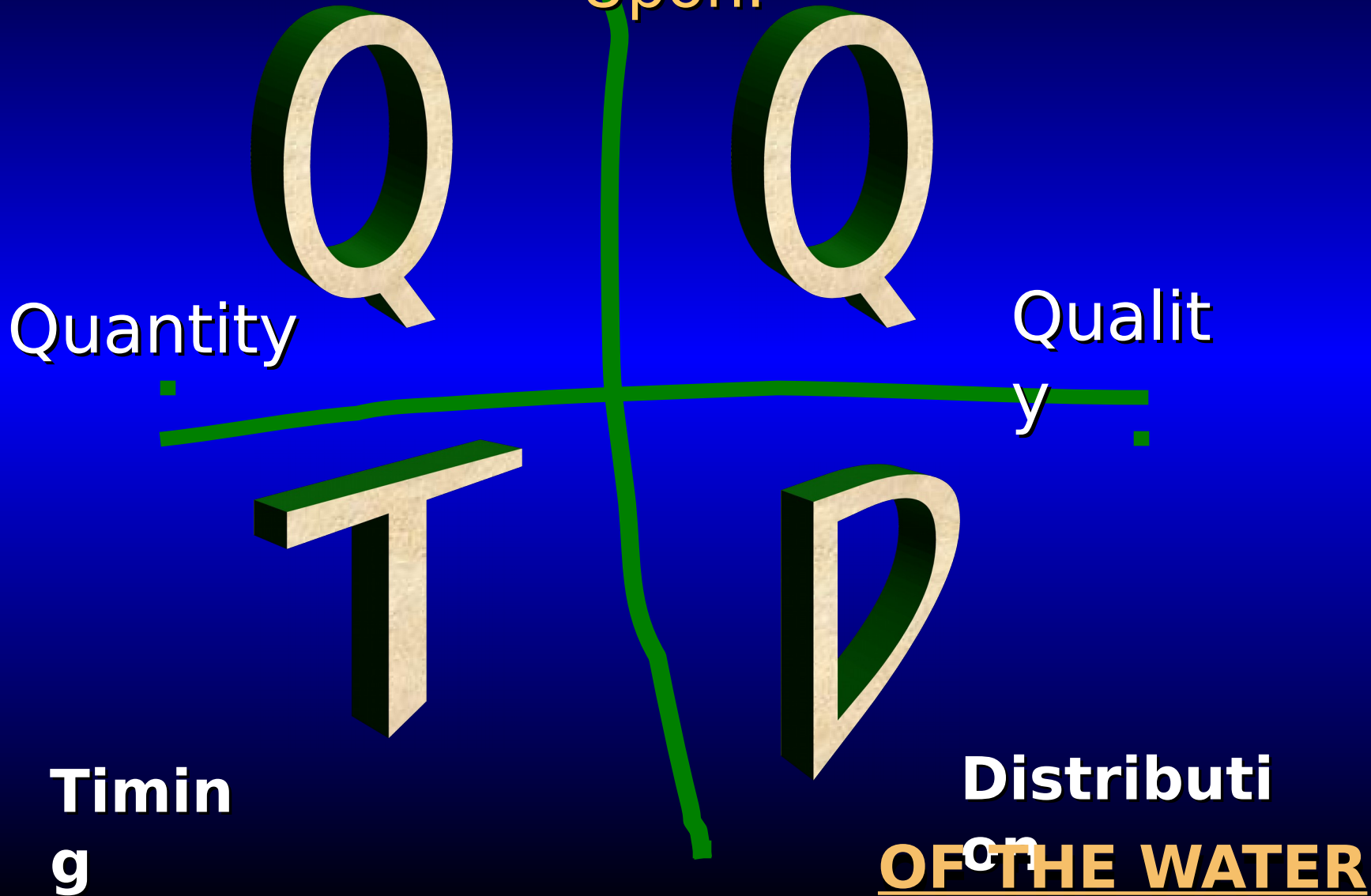
NER EVALUATION PROCESS



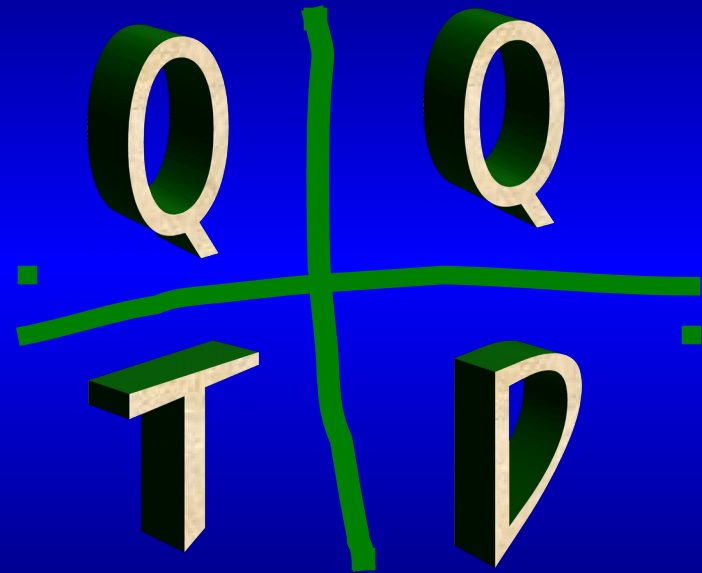
- ▮ **Identify relationship between changes in outputs and changes in costs. Completed through Cost Effectiveness and Incremental Cost Analysis**
- ▮ **No monetary net benefits or Benefit-to-Cost Ratio**

Aquatic Ecosystem Health is Dependent

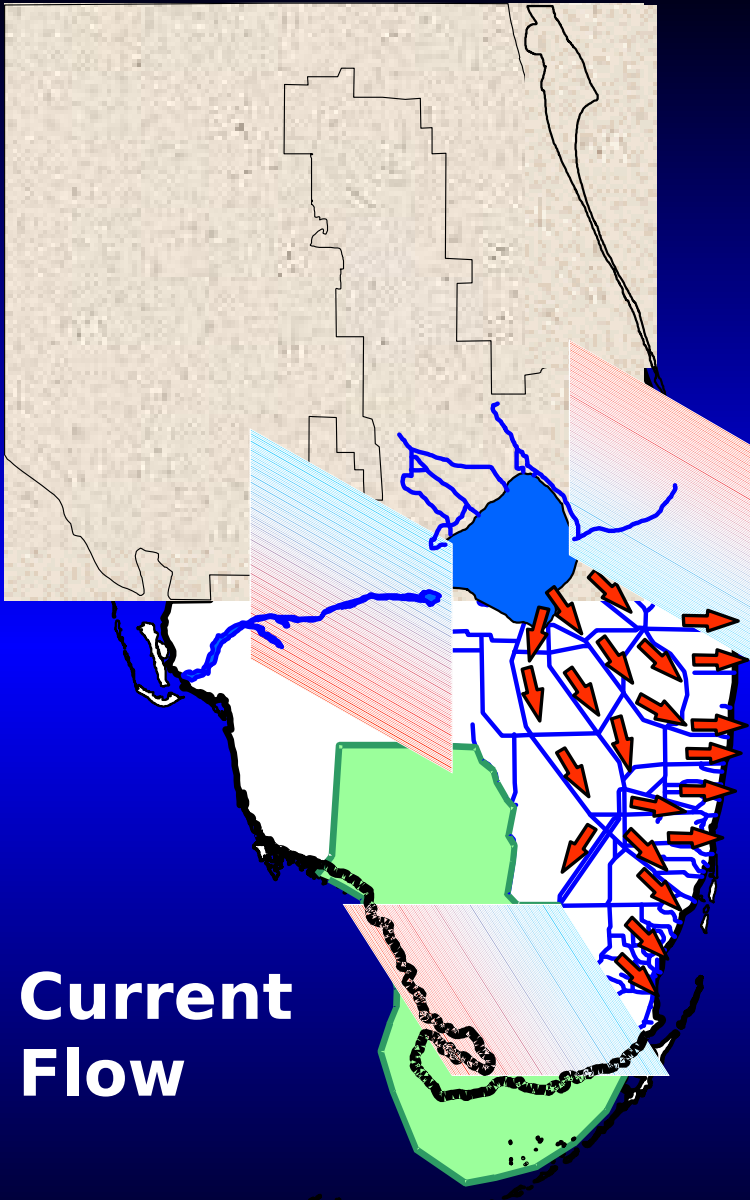
Upon:



An Ecosystem in *Why?* Trouble ...

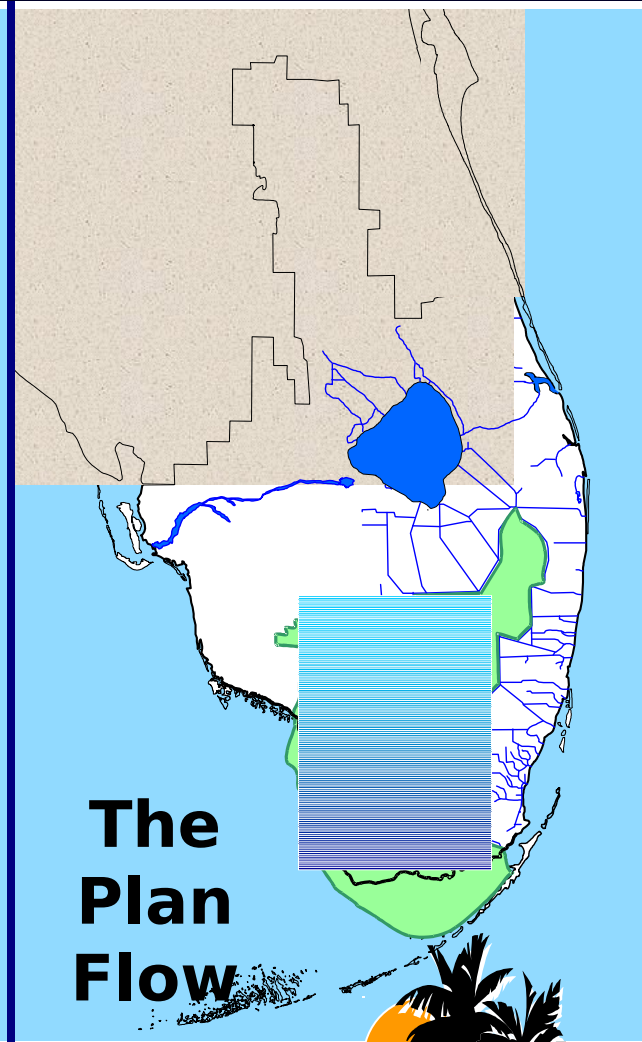
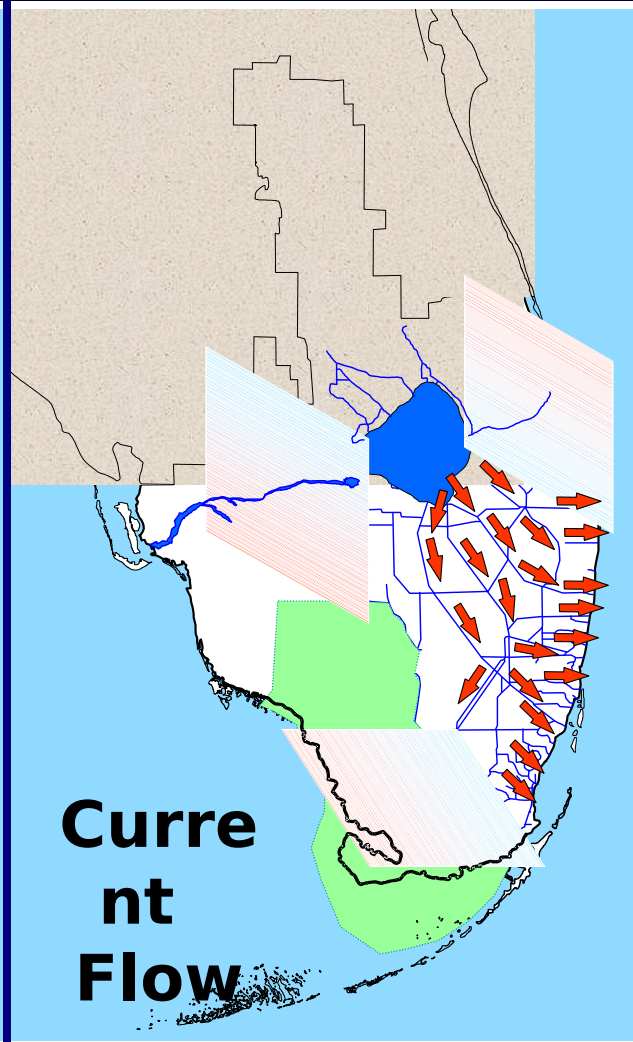
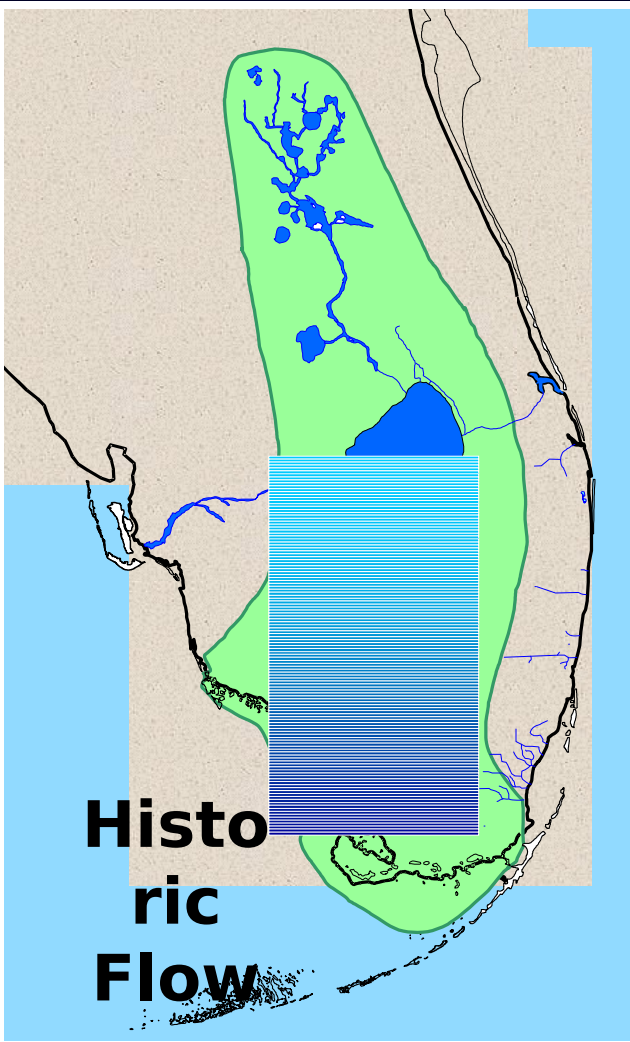


**Current
Flow**



America's Everglades are in Serious Peril

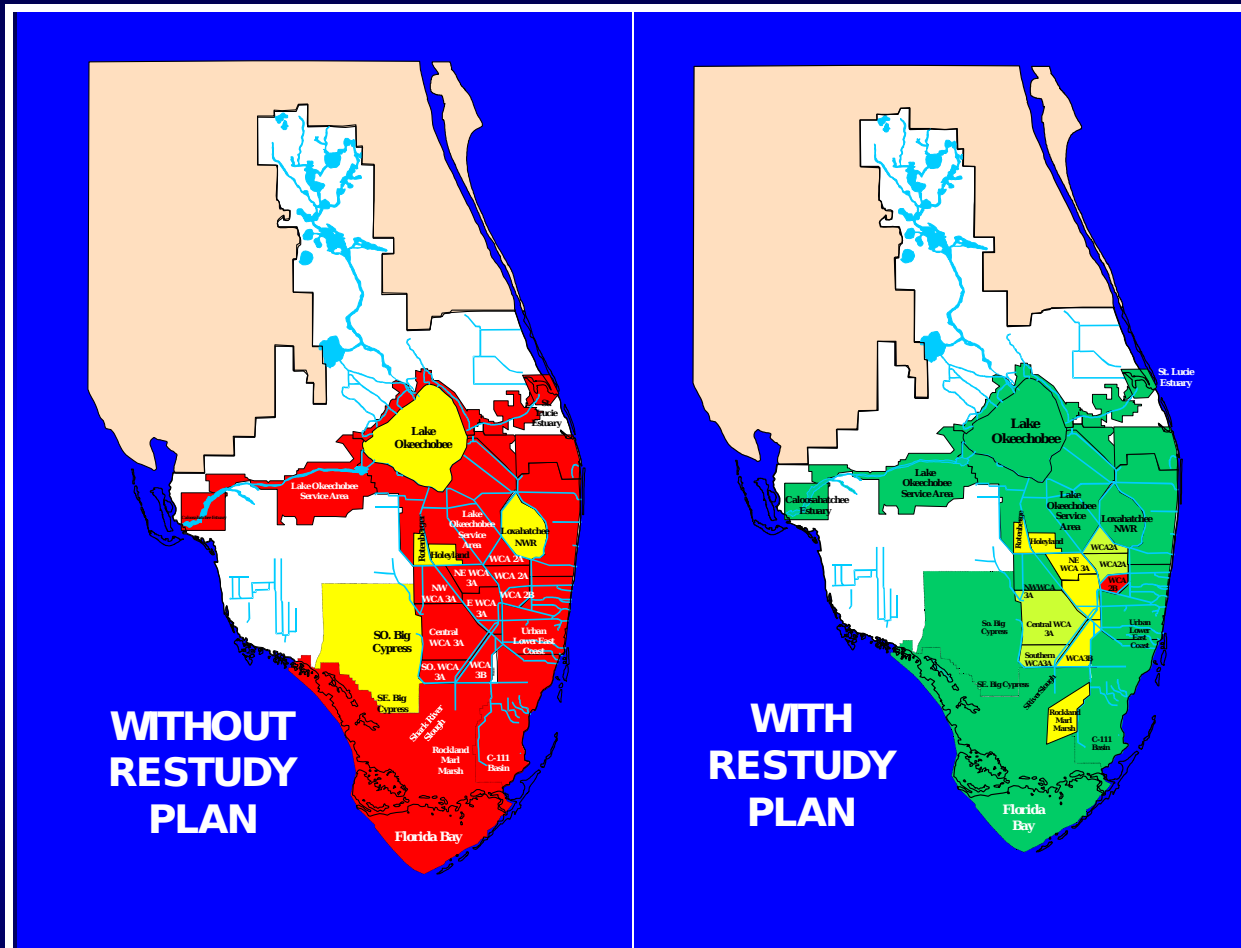




America's Everglades are in Serious Peril



Ecosystem Conditions



- = Successful
- = Marginal
- = Recovery Unlikely



America's Everglades are in Serious Peril

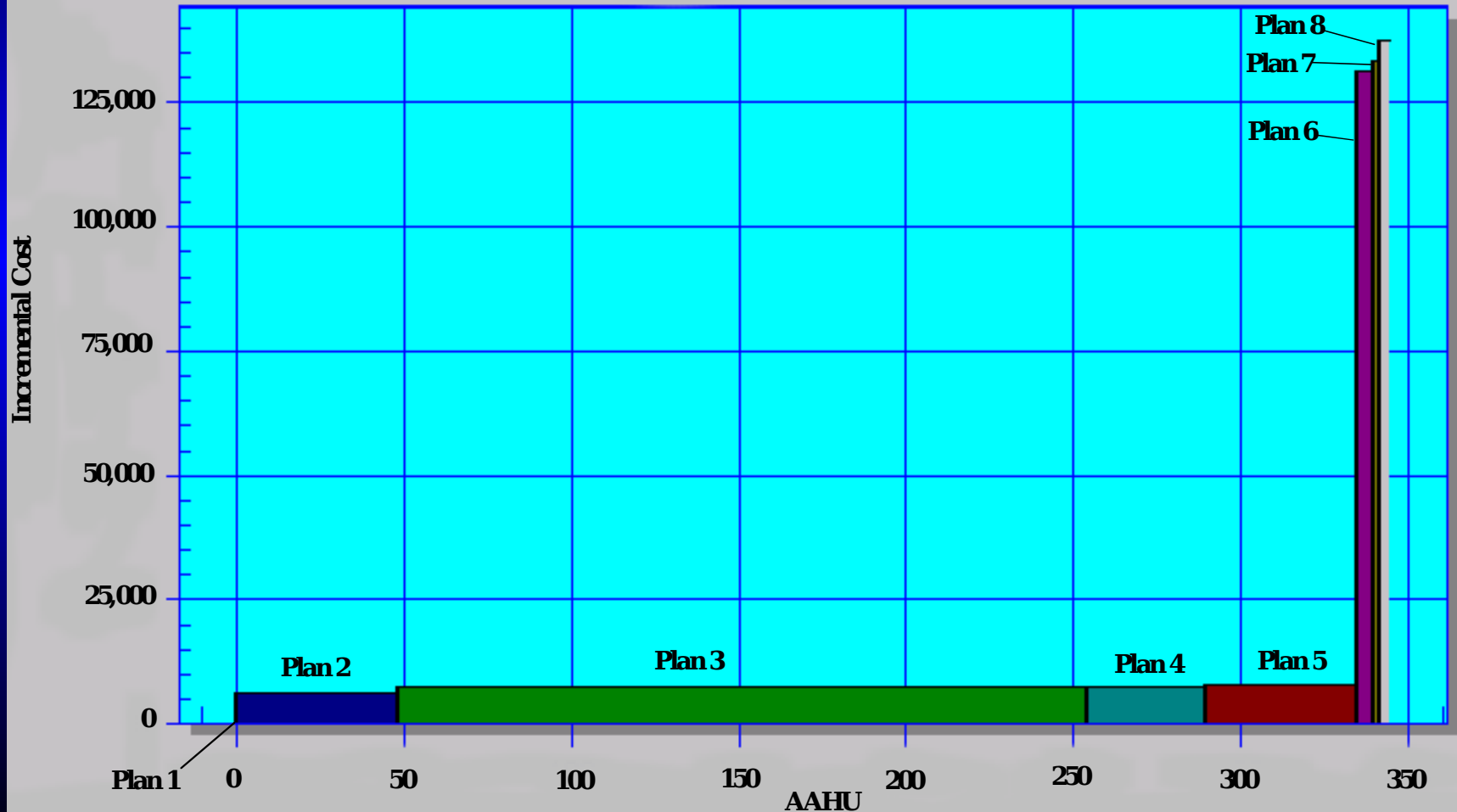
NER Evaluation

- **Cost Effectiveness Analysis and Incremental Cost Analysis (CEA/ICA)**
 - **A Tool to help determine two items**
 - **Most cost-effective alternative plans to reach various levels of restoration**
 - **To evaluate whether different levels of restoration are worth it**

Reference “IWR Plan” software package

Sample Incremental Analysis

"Best Buy" Plans



NER Evaluation Criteria

- **Efficiency**
- **Effectiveness**
- **Acceptability**
- **Completeness**

Reasonableness of cost is the test instead of BCR

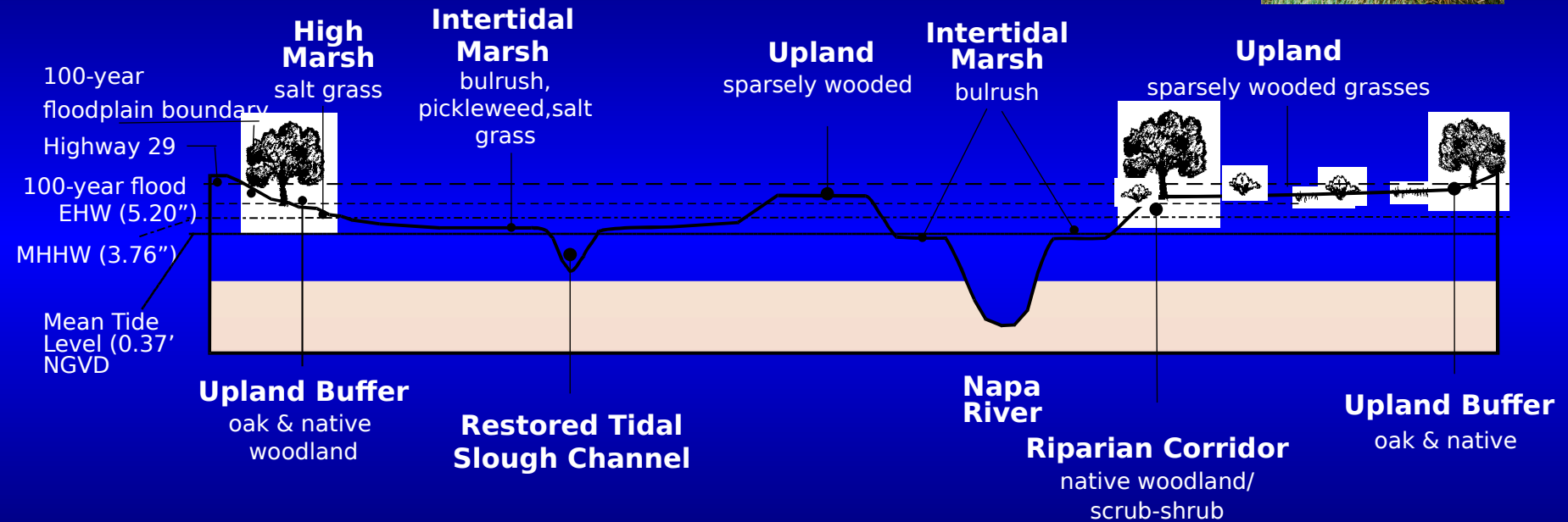
NER Evaluation Criteria

Other considerations to evaluate alternatives:

- Importance of Outputs.**
- Resource Significance.**
 - **Technical**
 - **Public**
 - **Institutional**

Technical Analysis

Habitat Types on Terraces



Evaluate Plans Environmentally

- ▮ **Determine environmental impacts / benefits caused by the alternative plans**
- ▮ **Prepare NEPA (National Environmental Policy Act) documentation [EIS, EA/FONSI] and other environmental compliance requirements**
- ▮ **If required, prepare an incremental justified mitigation plan**



More to come in Module 15

What is Mitigation ?

Mitigation addresses adverse environmental effects of new project construction and operation and should be planned and implemented concurrently (if not before).

Table 34: Summary Comparison of Detailed Plans for Duck Creek, Ohio ¹¹

	No Action	NED Plan	Locally Preferred Plan
1. PLAN DESCRIPTION	No Action/Without Project Condition	Reach DC-A 25-year protection; Reach DC-B 600-year protection; & Reach DC-C 100-year protection	Sections DC-A, DC-B, DC-C Uniform 100-year level of protection
2. IMPACT ASSESSMENT			
A. National Economic Development (NED)			
(1) Project Cost	\$0	\$13,805,000	\$14,000,000
(2) Annual Cost	\$0	\$0	\$1,443,000
(3) Total Annual Benefits	\$0	\$0	\$1,783,000
(4) Annual Net Benefits	\$0	\$0	\$0
(5) Benefit to Cost Ratio	N/A Ranks 3rd	N/A Ranks 1st	N/A Ranks 2nd
B. Environmental Quality (EQ)			
(1) Air/Noise	Normal noise levels created by traffic, business, and industrial activities. Ranks 1st	Temporary increased noise levels during 4-year construction period. Ranks 3rd	Temporary increased noise levels during 4-year construction period. Ranks 3rd
(2) Water Quality	Existing biota for streams in Southwestern Ohio. Excellent habitat for woodlarks, songbirds and urban wildlife. Ranks 1st	Temporary decreased biota populations during 4-year construction period. Possible increase in biota population with decrease in contaminant runoff from protected industrial areas. Ranks 1st (Tie).	Temporary increased biota populations during 4-year construction period. Contamination from flood runoff from adjacent industrial areas eliminated for all DC-A, and fully protected for DC-B and DC-C. Ranks 1st.
(3) Vegetation	Existing biota for streams in Southwestern Ohio. Excellent habitat for woodlarks, songbirds and urban wildlife. Ranks 1st	Temporary loss of 8 acres during 4-year construction period. Ranks 2nd	Permanent loss of 13 acres to project features; temporary loss of 8 acres during 4-year construction period. Ranks 3rd.
(4) Threatened & Endangered Species	No endangered species	No impact	No impact
(5) Aquatic Birds	Existing biota for streams in Southwestern Ohio. Excellent habitat for woodlarks, songbirds and urban wildlife. Ranks 1st	Temporary decreased biota populations during 4-year construction period. Possible increase in biota population with decrease in contaminant runoff from protected industrial areas. Ranks 1st (Tie).	Temporary decreased biota populations during 4-year construction period. Possible increase in biota population with decrease in contaminant runoff from protected industrial areas. Ranks 1st (Tie).
(6) Cultural Resources & Historic Properties	No cultural resources or historic properties in work area.	No impact	No impact.
C. Regional Economic Development (RED)	Same as National Economic Development (NED) impacts. Ranks 3rd.	Same as National Economic Development (NED) impacts. Ranks 1st	Same as National Economic Development (NED) impacts. Ranks 2nd.
D. Other Social Effects (OSE)			

See Sample of the Four
P&G Evaluation Accounts!
NED: EQ: RED: OSE:

The Concept of Risk

- Risk is a measure of the likelihood and severity of adverse outcomes
- Risk has to do with the future since the outcomes have not occurred yet.
- Risk analysis is a decision-making framework that comprises three tasks: risk assessment, risk management, and risk communication.

A Venn diagram on a dark blue background. A large light blue oval contains two overlapping circles and a text block below them. The left circle is blue and labeled 'Risk Assessment' with the bullet 'Analytically based'. The right circle is dark teal and labeled 'Risk Management' with the bullet 'Policy and preference based'. Below these circles, the text 'Risk Communication' is centered, followed by a bullet 'Interactive exchange of information, opinions, and preferences concerning risks'.

Risk Assessment

- Analytically based

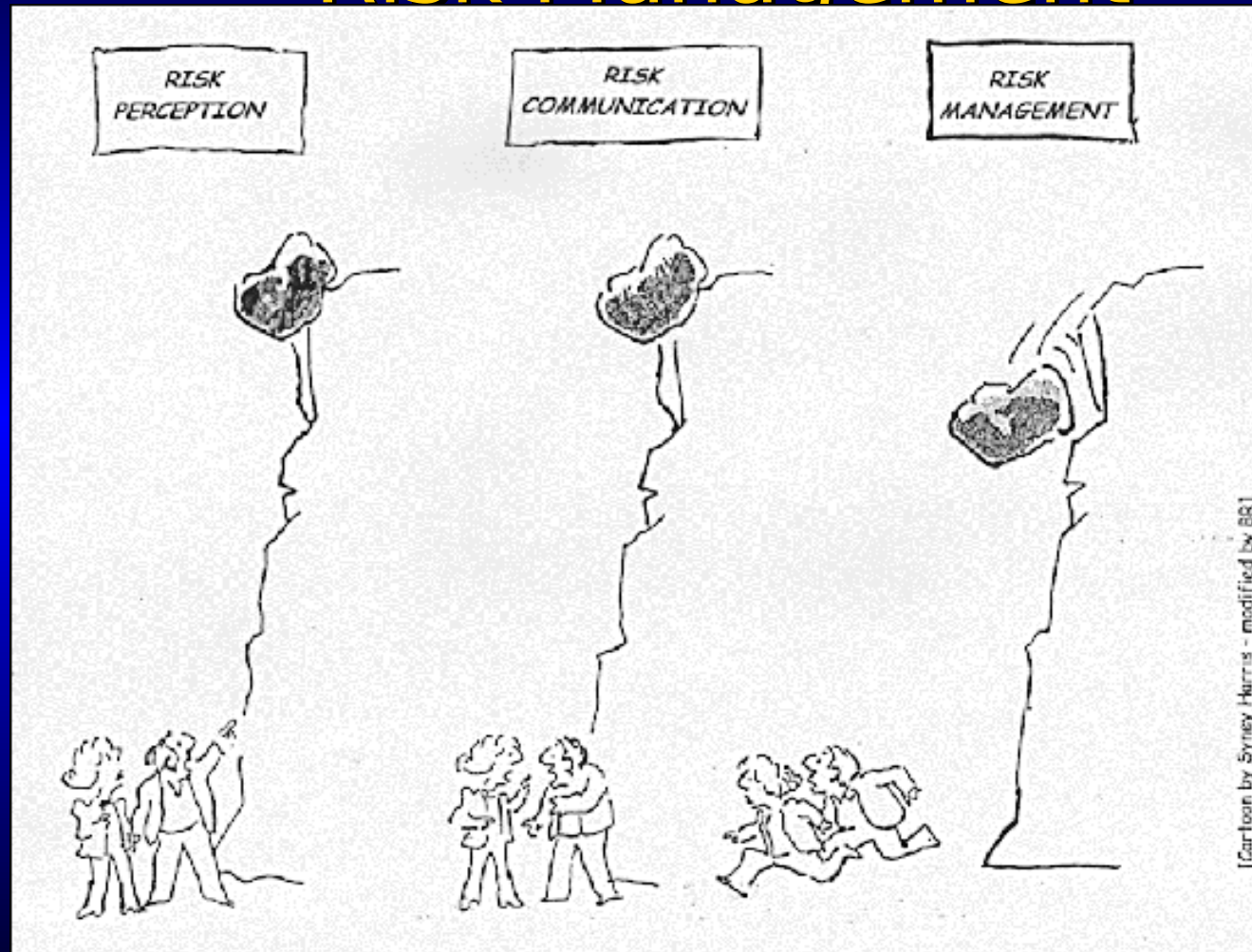
Risk Management

- Policy and preference based

Risk Communication

- Interactive exchange of information, opinions, and preferences concerning risks

Risk Management



Risk Analysis

		Severity of Consequences					
Likelihood of Occurrence		0 Negligible	1 Minor	2 Appreciable	3 Severe	4 Very Severe	5 Catastrophic
1	Virtually Impossible	Negligible	Negligible	Negligible	Negligible	Negligible	Broadly Acceptable
2	Improbable	Negligible	Negligible	Negligible	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable
3	Unlikely	Negligible	Negligible	Broadly Acceptable	Broadly Acceptable	Unacceptable	Unacceptable
4	Infrequent	Negligible	Negligible	Broadly Acceptable	Unacceptable	Unacceptable	Unacceptable
5	Occasional	Negligible	Broadly Acceptable	Broadly Acceptable	Unacceptable	Unacceptable	Unacceptable
6	Frequent	Negligible	Broadly Acceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable

Risk Communication

Know the audience

Involve the scientific experts

Establish expertise in communication

Use a credible source to deliver information

Share responsibility

Differentiate between science and value
judgment

Assure transparency

Put the risk in perspective

STEP 5: Comparison of Alternative Plans

▮ **There are different methods for comparing alternatives and their effects:**

- ▮ **Monetary evaluation method**
- ▮ **Multi-criteria evaluation method**
- ▮ **Trade-off analysis**
- ▮ **Goal achievement method**
- ▮ **Incremental cost/cost effectiveness analysis**
- ▮ **Non-monetary criteria (i.e. loss of life)**



STEP 6: Select Recommended Plan

Cost Effective:

- Current guidance calls for recommending the NED or NER Plan unless there is a locally preferred plan (LPP)
- LPP recommendation requires ASA(CW) concurrence
- Sponsors typically pay any cost above NED or Plan

Environmentally sound

Technically feasible



Why Change?

- Currently takes far too long to make a decision on the USACE Role
 - Typically not decided until NED/NER plan has been identified
 - Or 'backwards' planned to a sponsor solution, that may not be viable
- Up-front Federal/USACE role provides many advantages
 - More honest engagement with stakeholder/sponsors
 - Responsive to sponsor needs
 - Provides unified Agency response up front
 - Allows for more accurate scoping up front

CURRENT PROCESS

OPTIMIZED NED/NER

- “Optimum” solution as Decision Making Criteria
- Emphasis on one ‘perfect’ Alternative
- Participation based on optimum alternative
- Decision made at end of study

ADVANTAGES:

- Greater level of engineering detail
- Provides precise cost figures
- Provides a clear decision making framework

DISADVANTAGES:

- Assumes that there is an ‘optimum’ solution
- Delays decision making until the study investment is complete
- Requires extensive time and analysis
- Does not necessarily reflect sponsor or stakeholder concerns

versus

REVISED PROCESS

FEDERAL PROBLEM DETERMINATION

- Decision making based on identified problem and demonstrated need
- Can allow multiple alternative solutions
- Limits optimization effort, simplifying decision criteria
- Can be decided at beginning of study

ADVANTAGES:

- Moves decision making to beginning of study, prior to study investment
- Allows flexibility in decision making
- Allows flexibility in developing solutions, to include stakeholder needs
- Clarifies the purpose, need, and scope up front
- Provides early ‘buy-in’ from decision makers
- Speeds study and decision making process

DISADVANTAGES:

- Reduced level of engineering detail
- Increased Cost Risk
- Less clear decision making metrics

STEP 1:
Identify Problem,
Need, Scope

FEDERAL
PROBLEM
ASSESSMENT

STEP 2:
Assess Significance,
roles and
responsibilities

STEP 3:
Decision Point:
Federal Interest &
Scope

No Federal
Interest

Federal
Interest/N
o USACE
Interest

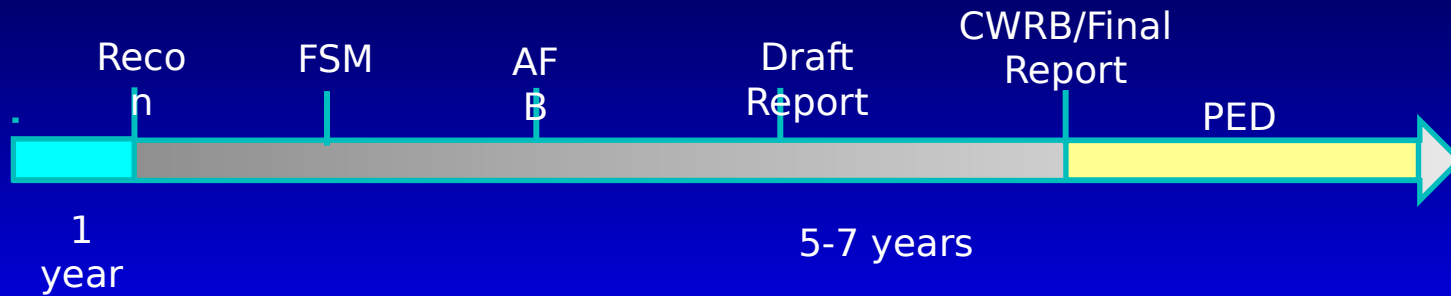
Federal
Interest
and
USACE
Interest

STEP 4:

Scope Follow on activities:
Technical or authorization
tracks

- Identify Preliminary solutions
 - Terminate USACE Study
 - Local implementation
- Identify preliminary solutions
- No traditional USACE construction interest
- Identify potential USACE actions
 - Watershed study
 - technical support
- Other Federal Agency/Local implementation
- Traditional construction pathway
 - Identify preliminary solutions
 - Identify USACE actions
 - Further design/NEPA
- Cost-allocation/Cost-sharing analysis
 - Make recommendations
 - Prepare Chief's Report

CURRENT PROCESS



PROPOSED PROCESS



Objective:

The last part of this module will discuss the following activities:

- Public involvement and Collaboration**
- Design**
- Fully Funded Cost Estimate**
- Sponsor Issues**



Public Involvement:

- ▮ Hold meetings with residents, businesses, local governments, special interests
- ▮ Hold public meetings/workshops
- ▮ Website/electronic meetings
- ▮ Newsletters



WHO'S THE PUBLIC?

Sponsor

Stakeholder

Non-Government Organizations

Interested Individuals

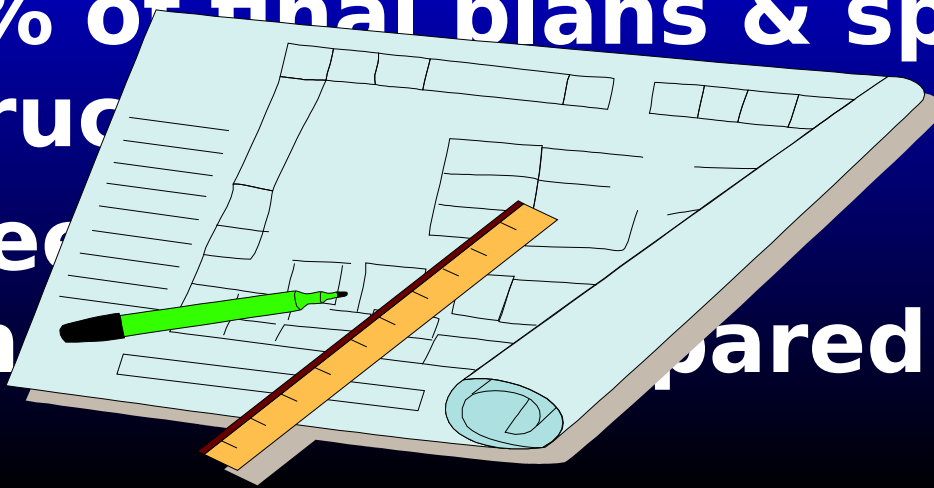
Other Agencies

Detailed Design:

- Once a recommended plan is determined, Engineering Division does the more detailed project design to a level roughly equivalent to

+/-30% of final plans & specs for construction

- Engineering Division prepares Appendices to be compared.



Fully Funded Cost Estimate

Project cost is first calculated for the base year of study and then fully funded (“inflated”) thru the end of project construction

SECTION 902 LIMITS

- ☐ Water Resources Development Act of 1986**
- ☐ Established a maximum cost of a project**
 - authorized project cost can not be increased by more than 20 percent (excluding inflation) without further Congressional authorization**

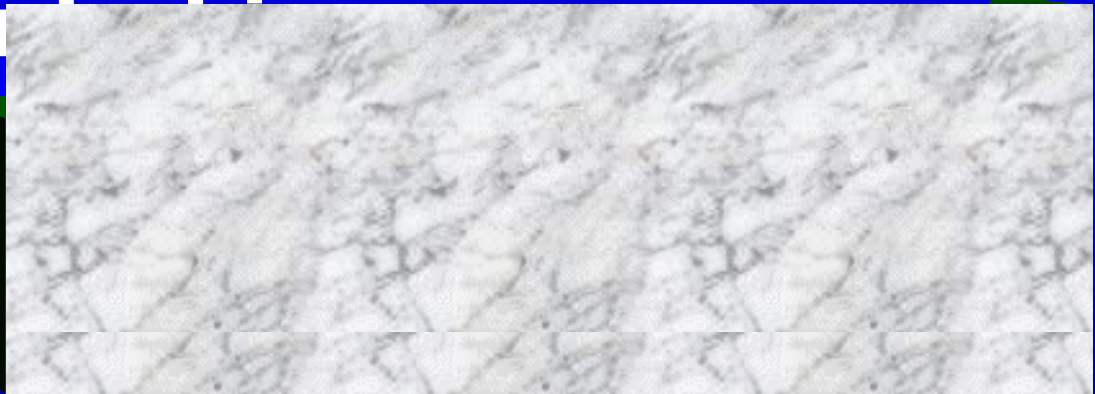
Sponsor Issues

- ❑ **Sponsor must be identified to cost share the project design and construction**
- ❑ **Sponsor must provide a letter of intent (LOI) stating their willingness to cost share project construction and operate/maintain project**
- ❑ **Sponsor must self-certify their ability to cost share construction and perform**

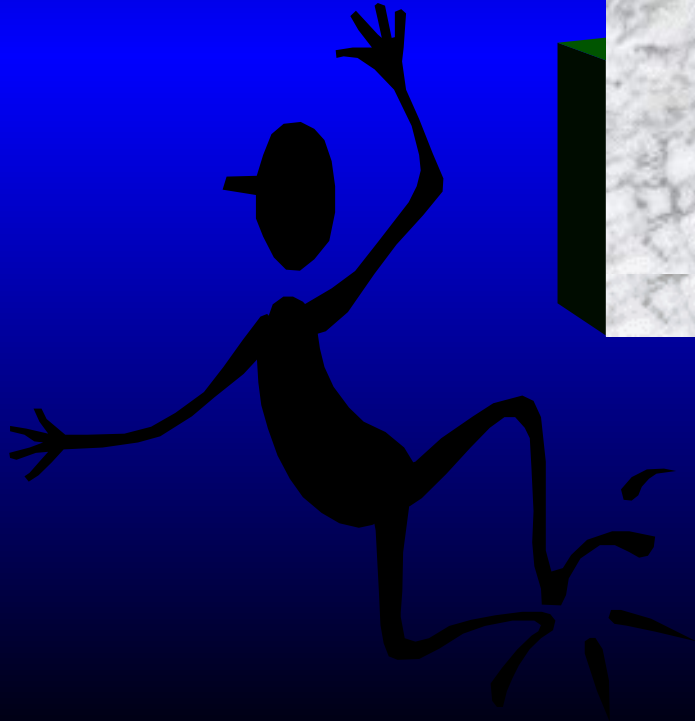


Feasibility Report:

**All the work performed during
this phase of the study is
documented.**



(More in Module 19)



SUMMARY

- ▮ **Planning is a formal process**
- ▮ **Determine “best” plan:**
 - ▮ **Economically justified**
 - ▮ **Environmentally sound**
 - ▮ **Engineeringly feasible**
 - ▮ **Socially & Politically acceptable**
- ▮ **Feasibility Report = Decision and Authorization Document**
- ▮ **Cost shared 50/50 with a non-Federal sponsor(s)**

